1. A method of fabricating a photonic crystal, comprising:

providing a substrate;

exposing the substrate to a plurality of first microspheres made of a first material, the first material being of a type that will bond to the substrate and form a self-passivated layer of first microspheres to produce a first layer; and

exposing the first layer to a plurality of second microspheres made of a second material, the second material being of a type that will bond to the first layer and form a self-passivated second layer of second microspheres.

2. The method according to claim 1, further comprising:

exposing the second layer to a plurality of the first microspheres made of a the first material, the first material being of a type that will bond to the second layer and form a self-passivated layer of first microspheres.

3. The method according to claim 2, further comprising:

repeatedly exposing a most recently formed layer to microspheres to a plurality of microspheres that will bond to the most recently formed layer and self-passivate to fabricate a multiple layer photonic crystal.

4. The method according to claim 1, wherein the first microspheres comprise streptavidin-coated microspheres and the second microspheres comprise biotin coated microspheres.

5. The method according to claim 4, wherein the substrate has biotinylated regions on a surface of the substrate.

6. The method according to claim 1, wherein the first microspheres comprise biotin-coated microspheres and the second microspheres comprise streptavidin-coated microspheres.

7. The method according to claim 1, wherein the bond comprises at least one of covalent bonding, electrostatic attraction, metallic bonding, hydrogen bonding, Van der Waals forces, hydrophobic/hydrophilic attractions and biological recognition.

8. The method according to claim 1, wherein one of the first and second microspheres have DNA strands on a surface thereof, and wherein the other of the first and second microspheres have at least one of complimentary DNA strands, complimentary RNA strands, oligonucleotides and DNA binding proteins on a surface thereof.

9. The method according to claim 1, wherein one of the first and second microspheres have RNA strands on a surface thereof, and wherein the other of the first and second microspheres have at least one of complimentary DNA strands, complimentary RNA strands, oligonucleotides and DNA binding proteins on a surface thereof.

10. The method according to claim 1, wherein one of the first and second microspheres have a protein situated on a surface thereof, and wherein the other of the first and second microspheres have at least one of an antigen and a ligand that bonds to the protein on a surface thereof.

11. The method according to claim 1, wherein the first microspheres have a first molecule with a first endgroup on a surface thereof, and wherein the second microspheres have a second molecule with a second endgroup on a surface thereof, wherein the first and second molecules bond to each other, but not to themselves, by formation of one of a covalent, ionic, metallic, hydrogen and Van der Waals bond.

12. The method according to claim 1, wherein one of the first and second microspheres have a bulk electrostatic charge or a surface electrostatic charge of a first charge state, and wherein the other of the first and second microspheres have a second bulk electrostatic charge or surface electrostatic charge with a second charge state which is opposite and attractive to the first charge state, wherein the first and second microspheres bond to each other by formation of ionic/electrostatic bonds, but do not bond to themselves.

13. The method according to claim 1, further comprising processing the first layer to form a surface that will bond to the second microspheres prior to exposing the first layer to the plurality of microspheres.

14. The method according to claim 1, wherein the substrate has a surface charge of a first polarity and wherein the first microspheres have a charge of a second polarity, and wherein the second microspheres have a charge of the first polarity.

15. The method according to claim 1, wherein the first and second microspheres are coated with first and second polyelectrolyte layers, wherein the first and second polyelectrolyte layers have opposite charge.

16. A method of fabricating a photonic crystal, comprising:

a) providing a substrate;

b) exposing the substrate to a plurality of first microspheres made of a first material, the first material being of a type that will bond to the substrate and form a self-passivated layer of first microspheres to produce a layer of microspheres;

c) modifying the first layer of microspheres to permit the first layer of microspheres to bond with other microspheres to thereby produce a bondable layer; and

d) exposing the bondable layer to a plurality of second microspheres to form a second layer of microspheres.

17. The method according to claim 16, wherein the plurality of second microspheres are made of the first material.

18. The method according to claim 16, wherein the plurality of second microspheres are made of a second material.

19. The method according to claim 16, further comprising:

modifying the second layer of microspheres to permit the second layer of microspheres to bond with other microspheres and thereby produce a second bondable layer;

exposing the second bondable layer to a plurality of microspheres to form a third self-passivated layer of microspheres to produce a three layer photonic crystal.

20. The method according to claim 16, further comprising repeating c) and d) a plurality of times to achieve a desired number of layers of a photonic crystal.

21. The method according to claim 16, wherein the bond comprises at least one of covalent bonding, electrostatic attraction, metallic bonding, hydrogen bonding, Van der Waals forces, hydrophobic/hydrophilic attractions and biological recognition.

22. The method according to claim 16, further comprising activating the bond of the microspheres by at least one of the following: addition of additive chemicals such as glutaraldehyde, by change in pH, and by exposure to radiation.

23. The method according to claim 16, wherein the first microspheres have a first charge, and wherein the modifying comprises coating the first microspheres with a polyelectrolyte film having charge opposite the first charge.

24. The method according to claim 23, wherein the second microspheres also have the first charge.

25. A photonic crystal structure, comprising:

a substrate processed to bond preferentially to a first material in selected areas;

a first layer of first microspheres, the first layer being one microsphere deep, the first microspheres comprising the first material and bonded to the selected areas of the substrate; and

a second layer of second microspheres one microsphere deep and bonded to the first layer of microspheres.

26. The apparatus according to claim 25, wherein one of the first and second microspheres comprise streptavidin-coated microspheres and the other of the first and second microspheres comprise biotin coated microspheres.

27. The apparatus according to claim 25, wherein one of the first and second microspheres have RNA strands on a surface thereof, and wherein the other of the first and second microspheres have at least one of complimentary DNA strands, complimentary RNA strands, oligonucleotides and RNA binding proteins on a surface thereof.

28. The apparatus according to claim 25, wherein the one of the first and second microspheres have DNA strands on a surface thereof, and wherein the other of the first and second microspheres have at least one of complimentary DNA strands, complimentary RNA strands, oligonucleotides and DNA binding proteins on a surface thereof.

29. The apparatus according to claim 25, wherein one of the first and second microspheres have a protein situated on a surface thereof, and wherein the other of the first and second microspheres have at least one of an antigen and a ligand that bonds to the protein on a surface thereof.

30. The apparatus according to claim 25, wherein first microspheres have a first molecule on a surface thereof, and wherein the second microspheres have a second molecule on a surface thereof, wherein the first and second molecules bond to each other but not to themselves.

31. The apparatus according to claim 25, wherein the first microspheres have a first bulk or surface electrostatic charge, and wherein the second microspheres have a second bulk or surface electrostatic charge which is opposite and attractive to the first electrostatic charge, wherein the first and second microspheres bond to each other but not to themselves.

32. The apparatus according to claim 25, wherein the bond comprises at least one of covalent bonding, electrostatic attraction, metallic bonding, hydrogen bonding, Van der Waals forces, hydrophobic/hydrophilic attractions and biological recognition.

33. The apparatus according to claim 25, wherein the second microspheres are comprised of a second material.

34. The apparatus according to claim 25, wherein the second microspheres are comprised of the first material.

35. The apparatus according to claim 25, wherein the substrate has a surface charge of a first polarity and wherein the first microspheres have a charge of a second polarity, and wherein the second microspheres have a charge of the first polarity.

36. The apparatus according to claim 25, wherein the first and second microspheres are coated with first and second polyelectrolyte layers, wherein the first and second polyelectrolyte layers have opposite charge.

37. A method of fabricating a photonic crystal, comprising:

providing a substrate;

bonding a single layer of microspheres one microsphere deep to the substrate to form a first layer; and

bonding a single layer of microspheres one microsphere deep to the first layer to form a second layer.

38. The method according to claim 37, further comprising repeatedly bonding a layer of microspheres one microsphere deep to a most recently formed layer to produce a multiple layer photonic crystal.

39. The method according to claim 37, wherein the bond comprises at least one of covalent bonding, electrostatic attraction, metallic bonding, hydrogen bonding, Van der Waals forces, hydrophobic/hydrophilic attractions and biological recognition.

40. The method according to claim 38, further comprising modifying the most recently formed layer to cause the layer to bond with a next layer of microspheres.

41. The method according to claim 37, wherein alternating layers of the multiple layer photonic crystal are comprised of microspheres of differing types.

42. The method according to claim 37, wherein the substrate has a surface charge of a first polarity and wherein the first microspheres have a charge of a second polarity, and wherein the second microspheres have a charge of the first polarity.

43. The method according to claim 37, wherein the first and second microspheres are coated with first and second polyelectrolyte layers, wherein the first and second polyelectrolyte layers have opposite charge.

44. A method of fabricating a photonic crystal, comprising:

providing a templated substrate having a first charge; and

exposing the templated substrate to a plurality of first microspheres having a polyelectrolyte coating carrying a second charge, the second charge being opposite the first charge so that the plurality of first microspheres will bond to the templated substrate and form a self-passivated layer of first microspheres to produce a first layer.

45. The method according to claim 44, further comprising:

exposing the first layer to a plurality of second microspheres having a polyelectrolyte coating carrying the second charge in order to bond to the first layer and form a self-passivated second layer of second microspheres.

46. The method according to claim 45, further comprising:

exposing the second layer to a plurality of the first microspheres having a polyelectrolyte coating carrying the first charge in order to bond to the second layer and form a self-passivated layer of first microspheres.

47. The method according to claim 46, further comprising:

repeatedly exposing a most recently formed layer to microspheres to a plurality of microspheres coated with a charged polyelectrolyte coating that will bond to the most recently formed layer and self-passivate to fabricate a multiple layer photonic crystal.

48. The method according to claim 47, wherein a last layer comprises carboxylated microspheres.

49. The method according to claim 45, wherein the first and second microspheres are coated with one of Poly(sodium 4 styrenesulfonate) and Poly(diallyldimethylammonium chloride).

50. A method of fabricating a photonic crystal, comprising:

a) providing a templated substrate;

b) exposing the templated substrate to a plurality of first microspheres made of a first material, the first material being of a type that will bond to the templated substrate and form a self-passivated layer of first microspheres to produce a layer of microspheres;

c) modifying the first layer of microspheres to permit the first layer of microspheres to bond with other microspheres to thereby produce a bondable layer by coating the first microspheres with a polyelectrolyte film having a first charge; and

d) exposing the bondable layer to a plurality of second microspheres having charge opposite the first charge to form a second layer of microspheres.

51. The method according to claim 50, further comprising:

modifying the second layer of microspheres to permit the second layer of microspheres to bond with other microspheres and thereby produce a second bondable layer by coating the second layer with a polyelectrolyte film;

exposing the second bondable layer to a plurality of microspheres to form a third self-passivated layer of microspheres to produce a three layer photonic crystal.

52. The method according to claim 51, further comprising repeating c) and d) a plurality of times to achieve a desired number of layers of a photonic crystal.

53. The method according to claim 50, wherein the first and second microspheres are coated with one of Poly(sodium 4 styrenesulfonate) and Poly(diallyldimethylammonium chloride).

54. A photonic crystal structure, comprising:

a templated substrate processed to bond preferentially to a first material in selected areas;

a first layer of first microspheres, the first layer being one microsphere deep, the first microspheres comprising the first material and bonded to the selected areas of the templated substrate; and

a charged polymer coating on the first microspheres.

55. The apparatus according to claim 54, further comprising a second layer of second microspheres one microsphere deep and bonded to the first layer of microspheres, the second microspheres having a charge that bonds to the charged polymer coating.

56. The apparatus according to claim 54, wherein the charged polymer comprises a polyelectrolyte.

57. The method according to claim 56, wherein the charged polymer comprises one of Poly(sodium 4 styrenesulfonate) and Poly(diallyldimethylammonium chloride).

58. A method of fabricating a photonic crystal, comprising:

providing a templated substrate;

bonding a single layer of charged polymer coated microspheres one microsphere deep to the templated substrate to form a first layer; and

bonding a single layer of charged polymer coated microspheres one microsphere deep to the first layer to form a second layer.

59. The method according to claim 58, further comprising repeatedly bonding a layer of charged polymer coated microspheres one microsphere deep to a most recently formed layer to produce a multiple layer photonic crystal.

60. The apparatus according to claim 58, wherein the charged polymer comprises a polyelectrolyte.

61. The method according to claim 60, wherein the charged polymers are selected from Poly(sodium 4 styrenesulfonate) and Poly(diallyldimethylammonium chloride).

62. A method of fabricating a photonic crystal, comprising:

bonding a single layer of charged polymer coated microspheres one microsphere deep to a substrate to form a first layer; and

bonding a single layer of charged polymer coated microspheres one microsphere deep to the first layer to form a second layer.

63. The method according to claim 62, further comprising repeatedly bonding a layer of charged polymer coated microspheres one microsphere deep to a most recently formed layer to produce a multiple layer photonic crystal.

64. The apparatus according to claim 62, wherein the charged polymer comprises a polyelectrolyte.

65. The method according to claim 64, wherein the charged polymers are selected from Poly(sodium 4 styrenesulfonate) and Poly(diallyldimethylammonium chloride).